CLAIMS

What is claimed is:

1   1.   A method for calibrating audio resources on a consumer electronic device,
2 comprising:
3   prompting a user of the device to make a calibration sound using an item likely to be
4 available to the user, other than the audio resources on the device;
5   executing a process using audio resources in the device to calibrate the device with
6 reference to the calibration sound.

1   2.   The method of claim 1, wherein said process includes determining a setting of the
2 audio resources which results in production of a masking sound by the device which masks the
3 calibration sound; and saving the setting.

1   3.   The method of claim 1, wherein said device comprises a computer including a
2 programmable volume control parameter for the audio resources, said process includes
3 determining a setting of the audio resources which results in production of a masking sound by
4 the device which masks the calibration sound, and said setting comprises a setting for said
5 programmable volume control parameter.

1   4.   The method of claim 1, wherein said process includes determining a setting of the
2 audio resources which results in production of a masking sound by the device which masks the
3 calibration sound; and including
4   instructing the user to signal completion of said process when a condition is achieved in
5 which the masking sound masks the calibration sound, wherein said instructions use terminology
6 semantically equivalent to "drowns out" to describe the condition.

1   5.   The method of claim 1, including generating a control signal to produce an audio
2 stimulus on the device, the control signal being based upon said calibration.

1   6.   The method of claim 1, including generating a control signal to produce an audio

2   stimulus on the device, the control signal being based upon said calibration, and resulting in said

3   audio stimulus having a sound pressure level within 10 dB of a predicted level.

1   7.   The method of claim 1, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user.

1   8.   The method of claim 1, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user, the instructions including a description of

3   a technique for making the calibration sound using the item, and a description of a process for

4   controlling the device to generate a masking sound.

1   9.   The method of claim 1, wherein said item comprises a sheet of paper.

1   10.   The method of claim 1, wherein said item comprises a sheet of paper, and said

2   device includes a display, and said prompting includes displaying instructions to the user, the

3   instructions including a description of a technique for making the calibration sound by rubbing

4   the sheet of paper, and a description of a process for controlling the device to generate the

5   masking sound.

1   11.   The method of claim 1, wherein said item comprises two sheets of paper, said

2   prompting includes providing instructions to the user, the instructions including a description of

3   a technique for making the calibration sound by folding a first piece of paper, laying the second

4   piece of paper on a desk, and rubbing the first sheet of paper on the second sheet of paper, and a

5   description of a process for controlling the device to generate the masking sound.

1   12.   The method of claim 1, wherein said item comprises an alphanumeric keyboard,

2   said prompting includes providing instructions to the user, the instructions including a

3   description of a technique for making the calibration sound by striking the keyboard.

1   13.   The method of claim 1, wherein said item comprises a pencil, said prompting

2 includes providing instructions to the user, the instructions including a description of a technique

3 for making the calibration sound by rubbing the pencil on a surface.

1   14.   The method of claim 1, wherein said item comprises a desk, said prompting

2 includes providing instructions to the user, the instructions including a description of a technique

3 for making the calibration sound by tapping the desk.

1   15.   The method of claim 1, wherein said item comprises a coin, said prompting

2 includes providing instructions to the user, the instructions including a description of a technique

3 for making the calibration sound by dropping the coin on a surface.

1   16.   The method of claim 1,wherein said item comprises a keychain, said prompting

2 includes providing instructions to the user, the instructions including a description of a technique

3 for making the calibration sound by jingling the keychain.

1   17.   The method of claim 1, wherein said process comprises an interaction in which

2 the user supplies input signals to adjust a masking sound until a condition is met.

1   18.   The method of claim 1, wherein said process comprises a routine which

2 automatically adjusts a masking sound, and an interaction in which the user supplies an input

3 signal to indicate that a condition is met.

1   19.   The method of claim 1, including determining if the user can hear the calibration

2 sound, and if not, then executing an alternative process.

1   20.   The method of claim 1, including determining if the user can hear the calibration

2 sound, and if not, then executing an alternative process, the alternative process determining a

3 setting at which the user cannot hear a set of test sounds.

1   21.   The method of claim 1, wherein said process includes at least one flow which is
2 executed if an error condition occurs, that prompts the user to perform an act to correct a
3 possible source of the error.

1   22.   The method of claim 1, wherein said process includes using the audio resources
2 to produce a masking sound by the device, and determining a setting for the audio resources at
3 which the masking sound masks the calibration sound.

1   23.   The method of claim 1, wherein said process includes providing input to the
2 audio resources to produce a masking sound by the device, the input including substantially
3 randomly generated signals, and determining a setting for the audio resources at which the
4 masking sound masks the calibration sound.

1   24.   The method of claim 1, wherein said process includes providing input to the
2 audio resources to produce a masking sound by the device, the input including signals to produce
3 a masking sound having an audio spectrum matching a spectrum expected for the calibration
4 sound, and determining a setting for the audio resources at which the masking sound masks the
5 calibration sound.

1   25.   A method for calibrating audio resources on a consumer electronic device,
2 comprising:
3   prompting a user of the device to make a calibration sound using an item other than the
4 audio resources on the device; and
5   executing a process using audio resources in the device to calibrate the device with
6 reference to the calibration sound, wherein said process includes determining a setting of the
7 audio resources which results in production of a masking sound by the device which masks the
8 calibration sound.

1   26.   The method of claim 25, wherein said prompting includes providing instructions
2 to the user describing said process, including instructing the user to signal completion of said
3 process when a condition is achieved in which the masking sound masks the calibration sound,

4   wherein said instructions use terminology semantically equivalent to "drowns out" to describe

5   the condition.

1   27.   The method of claim 25, including saving the setting.

1   28.   The method of claim 25, including generating a control signal to produce an

2   audio stimulus on the device, the control signal being based upon said setting.

1   29.   The method of claim 25, including generating a control signal to produce an

2   audio stimulus on the device, the control signal being based upon said setting, and resulting in

3   said audio stimulus having a sound pressure level within about 10 dB of a predicted level.

1   30.   The method of claim 25, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user.

1   31.   The method of claim 25, wherein said device includes a display, and said

2   instructions including a description of a technique for making the calibration sound, and a

3   description of a process for controlling the device to generate the masking sound.

1   32.   The method of claim 25, wherein said device comprises a computer including a

2   programmable volume control parameter for the audio resources, and said setting comprises a

3   setting for said programmable volume control parameter.

1   33.   The method of claim 25, wherein said process comprises an interaction in which

2   the user supplies input signals to adjust the masking sound until the condition is met.

1   34.   The method of claim 25, wherein said process comprises a routine which

2   automatically adjusts the masking sound, and an interaction in which the user supplies an input

3   signal to indicate that the condition is met.

1   35.   The method of claim 25, including determining if the user can hear the calibration

2   sound, and if not, then executing an alternative process.

1   36.   The method of claim 25, including determining if the user can hear the calibration

2   sound, and if not, then executing an alternative process, the alternative process determining a

3   setting at which the user cannot hear a set of test sounds.

1   37.   The method of claim 25, wherein said process includes at least one flow which is

2   executed if an error condition occurs, that prompts the user to perform an act to correct a

3   possible source of the error.

1   38.   The method of claim 25, wherein said process includes providing input to the

2   audio resources to produce the masking sound, the input including substantially randomly

3   generated signals.

1   39.   The method of claim 25, wherein said process includes providing input to the

2   audio resources to produce the masking sound, the input including signals to produce a masking

3   sound having an audio spectrum matching a spectrum expected for the calibration sound.

1   40.   A method for calibrating audio resources on a consumer electronic device,

2   comprising:

3   prompting a user of the device to make a calibration sound using an item other than the

4   audio resources on the device; and

5   executing a process using audio resources in the device to calibrate the device with

6   reference to the calibration sound, wherein said process includes determining a setting of the

7   audio resources which results in production of a test sound by the device, the masking sound

8   having an audio spectrum matching a spectrum expected for the calibration sound..

1   41.   The method of claim 40, wherein said prompting includes providing instructions

2   to the user describing said process, including instructing the user to signal completion of said

3   process when a condition is achieved in which the test sound masks the calibration sound,

4   wherein said instructions use terminology semantically equivalent to "drowns out" to describe

5   the condition.

1   42.   The method of claim 40, including generating a control signal to produce an

2   audio stimulus on the device, the control signal being based upon said setting.

1   43.   The method of claim 40, including generating a control signal to produce an

2   audio stimulus on the device, the control signal being based upon said setting, and resulting in

3   said audio stimulus having a sound pressure level within about 10 dB of a predicted level.

1   44.   The method of claim 40, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user.

1   45.   The method of claim 40, wherein said device includes a display, and said

2   prompting includes displaying a description of a technique for making the calibration sound, and

3   a description of a process for controlling the device to generate the test sound.

1   46.   The method of claim 40, wherein said device comprises a computer including a

2   programmable volume control parameter for the audio resources, and said setting comprises a

3   setting for said programmable volume control parameter.

1   47.   The method of claim 40, wherein said process comprises an interaction in which

2   the user supplies input signals to adjust the test sound until the condition is met.

1   48.   The method of claim 40, wherein said process comprises a routine which

2   automatically adjusts the test sound, and an interaction in which the user supplies an input signal

3   to indicate that the condition is met.

1   49.   A method for conducting a hearing test using a computer program, comprising:

2   establishing a communication channel between a remote device and a server in a

3   communication network;

4   prompting a user of the remote device, using resources provided via said communication

5   channel, to make a calibration sound using an item likely to be available to the user, other than

6   the audio resources on the device;

7   executing a calibration process using audio resources in the device to determine a

8   calibration of the audio resources which results in production of a masking sound by the remote

9   device which masks the calibration sound; and

10   executing a computer program to present a hearing test to the user of the remote device,

11   wherein the computer program comprises a routine, responsive to said calibration.

1   50.   The method of claim 49, wherein said computer program adaptively selects

2   stimuli for the hearing test based upon said interaction produced at the remote device using the

3   calibration.

1   51.   The method of claim 49, wherein said hearing test comprises an N-alternative

2   forced choice interaction.

1   52.   The method of claim 49, wherein the communication network comprises a packet

2   switched network.

1   53.   The method of claim 49, wherein the communication network comprises a

2   network executing according a standard internet protocol.

1   54.   The method of claim 49, wherein the channel comprises a connection according

2   to a standard transmission control protocol over a standard internet protocol (TCP/IP).

1   55.   The method of claim 49, wherein the channel comprises a link through a cellular

2   telephone network.

1   56.   The method of claim 49, wherein the channel comprises a link through a pager

2   network.

1   57.   The method of claim 49, wherein the remote device comprises one of a mobile

2   phone, a home computer, and a hand held computing platform.

1   58.   The method of claim 49, wherein said calibration process includes determining a

2   setting of the audio resources which results in production of the masking sound by the device

3   which masks the calibration sound; and saving the setting.

1   59.   The method of claim 49, wherein said device comprises a computer including a

2   programmable volume control parameter for the audio resources, said calibration process

3   includes determining a setting of the audio resources which results in production of the masking

4   sound by the device which masks the calibration sound, and said setting comprises a setting for

5   said programmable volume control parameter.

1   60.   The method of claim 49, wherein said calibration process includes instructing the

2   user to signal completion of said calibration process when a condition is achieved in which the

3   masking sound masks the calibration sound, wherein said instructions use terminology

4   semantically equivalent to "drowns out" to describe the condition.

1   61.   The method of claim 49, wherein the routine responsive to the calibration

2   includes generating a control signal to produce an audio stimulus on the device, the control

3   signal being based upon said calibration, and resulting in said audio stimulus having a sound

4   pressure level within about 10 dB of a predicted level.

1   62.   The method of claim 49, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user.

1   63.   The method of claim 49, wherein said device includes a display, and said

2   prompting includes displaying instructions to the user, the instructions including a description of

3   a technique for making the calibration sound using the item, and a description of a process for

4   controlling the device to generate the masking sound.

1   64.   The method of claim 49, wherein said item comprises a sheet of paper.

1   65.   The method of claim 49, wherein said item comprises a sheet of paper, and said

2   device includes a display, and said prompting includes displaying instructions to the user, the

3   instructions including a description of a technique for making the calibration sound by rubbing

4   the sheet of paper, and a description of a process for controlling the device to generate the

5   masking sound.

1   66.   The method of claim 49, wherein said item comprises two sheets of paper, said

2   prompting includes providing instructions to the user, the instructions including a description of

3   a technique for making the calibration sound by folding a first piece of paper, laying the second

4   piece of paper on a desk, and rubbing the first sheet of paper on the second sheet of paper, and a

5   description of a process for controlling the device to generate the masking sound.

1   67.   The method of claim 49, wherein said item comprises an alphanumeric keyboard,

2   said prompting includes providing instructions to the user, the instructions including a

3   description of a technique for making the calibration sound by striking the keyboard.

1   68.   The method of claim 49, wherein said item comprises a pencil, said prompting

2   includes providing instructions to the user, the instructions including a description of a technique

3   for making the calibration sound by rubbing the pencil on a surface.

1   69.   The method of claim 49, wherein said item comprises a desk, said prompting

2   includes providing instructions to the user, the instructions including a description of a

3   technique for making the calibration sound by tapping the desk.

1   70.   The method of claim 49, wherein said item comprises a coin, said prompting
2   includes providing instructions to the user, the instructions including a description of a technique
3   for making the calibration sound by dropping the coin on a surface.

1   71.   The method of claim 49, wherein said item comprises a keychain, said prompting
2   includes providing instructions to the user, the instructions including a description of a technique
3   for making the calibration sound by jingling the keychain.

1   72.   The method of claim 49, wherein said calibration process comprises an
2   interaction in which the user supplies input signals to adjust the masking sound until the
3   condition is met.

1   73.   The method of claim 49, wherein said calibration process comprises a routine
2   which automatically adjusts the masking sound, and an interaction in which the user supplies an
3   input signal to indicate that the condition is met.

1   74.   The method of claim 49, including determining if the user can hear the calibration
2   sound, and if not, then executing an alternative calibration process.

1   75.   The method of claim 49, including determining if the user can hear the calibration
2   sound, and if not, then executing an alternative calibration process, the alternative calibration
3   process determining a setting at which the user can hear a set of test sounds.

1   76.   The method of claim 49, wherein said calibration process includes at least one
2   flow which is executed if an error condition occurs, that prompts the user to perform an act to
3   correct a possible source of the error.

1   77.   The method of claim 49, wherein said calibration process includes determining a
2   setting for the audio resources at which the masking sound masks the calibration sound.

1   78.   The method of claim 49, wherein said calibration process includes providing
2   input to the audio resources to produce the masking sound, the input including substantially

3   randomly generated signals, and determining a setting for the audio resources at which the

4   masking sound masks the calibration sound.

1   79.   The method of claim 49, wherein said calibration process includes providing

2   input to the audio resources to produce the masking sound, the input including signals to produce

3   the masking sound having an audio spectrum matching a spectrum expected for the calibration

4   sound, and determining a setting for the audio resources at which the masking sound masks the

5   calibration sound.

1   80.   An apparatus comprising:

2   a data processor which executes instructions;

3   a communication interface coupled to the processor; and

4   memory coupled to the data processor which stores instructions in a form readable by the

5   data processor, the instructions specifying processes which

6   establish a communication channel to a remote device across the

7   communication interface;

8   prompt a user of the remote device, using resources provided via said

9   communication channel, to make a calibration sound, using something other than

10   the audio resources on the device;

11   execute a calibration process using audio resources in the device to

12   determine a calibration of the audio resources which results in production of a

13   masking sound by the remote device which masks the calibration sound; and

14   execute a computer program to present a hearing test to the user of the

15   remote device, wherein the computer program comprises a routine, responsive to

16   said calibration.

1   81.   The apparatus of claim 80, wherein said computer program adaptively selects

2   stimuli for the hearing test based upon said interaction produced at the remote device using the

3   calibration.

1   82.   The apparatus of claim 80, wherein said hearing test comprises an N-alternative

2   forced choice interaction.

1   83.   The apparatus of claim 80, wherein the communication interface is coupled to a

2   cellular telephone network.

1   84.   The apparatus of claim 80, wherein the communication interface is coupled to a

2   pager network.

1   85.   The apparatus of claim 80, wherein the remote device comprises one of a mobile

2   phone, a home computer, and a hand held computing platform.

1   86.   The apparatus of claim 80, wherein said remote device comprises a computer

2   including a programmable volume control parameter for the audio resources, said calibration

3   process includes determining a setting of the audio resources which results in production of the

4   masking sound by the device which masks the calibration sound, and said setting comprises a

5   setting for said programmable volume control parameter.

1   87.   The apparatus of claim 80, wherein said calibration process includes determining

2   a setting of the audio resources which results in production of the masking sound by the device

3   which masks the calibration sound; and including

4   the instructions further specify a process which instructs the user to signal completion of

5   said calibration process when the condition met, the condition being the perception the masking

6   sound masks the calibration sound, wherein said instructions use terminology semantically

7   equivalent to "drowns out" to describe the condition.

1   88.   The apparatus of claim 80, wherein said hearing test includes generating a control

2   signal to produce an audio stimulus on the device, the control signal being based upon said

3   calibration, and resulting in said audio stimulus having a sound pressure level within 10 dB of a

4   predicted level.

1   89.   The apparatus of claim 80, wherein said remote device includes a display, and

2   said prompting includes displaying instructions to the user on said display.

90. The apparatus of claim 80, wherein said remote device includes a display, and said prompting includes displaying instructions to the user on said display, the instructions including a description of a technique for making the calibration sound using an item likely to be available to the user, and a description of a process for controlling the device to generate a masking sound.

91. The apparatus of claim 90, wherein said item comprises a sheet of paper.

92. The apparatus of claim 90, wherein said item comprises a sheet of paper, and said device includes a display, and said prompting includes displaying instructions to the user, the instructions including a description of a technique for making the calibration sound by rubbing the sheet of paper, and a description of a process for controlling the device to generate the masking sound.

93. The apparatus of claim 90, wherein said item comprises two sheets of paper, said prompting includes providing instructions to the user, the instructions including a description of a technique for making the calibration sound by folding a first piece of paper, laying the second piece of paper on a desk, and rubbing the first sheet of paper on the second sheet of paper, and a description of a process for controlling the device to generate the masking sound.

94. The apparatus of claim 90, wherein said item comprises an alphanumeric keyboard, said prompting includes providing instructions to the user, the instructions including a description of a technique for making the calibration sound by striking the keyboard.

95. The apparatus of claim 90, wherein said item comprises a pencil, said prompting includes providing instructions to the user, the instructions including a description of a technique for making the calibration sound by rubbing the pencil on a surface.

96. The apparatus of claim 90, wherein said item comprises a desk, said prompting includes providing instructions to the user, the instructions including a description of a technique for making the calibration sound by tapping the desk.

1   97.   The apparatus of claim 90, wherein said item comprises a coin, said prompting

2   includes providing instructions to the user, the instructions including a description of a technique

3   for making the calibration sound by dropping the coin on a surface.

1   98.   The apparatus of claim 90, wherein said item comprises a key chain, said

2   prompting includes providing instructions to the user, the instructions including a description of

3   a technique for making the calibration sound by jingling the key chain.

1   99.   The apparatus of claim 80, wherein said calibration process comprises a routine

2   which automatically adjusts a masking sound, and an interaction in which the user supplies an

3   input signal to indicate that the condition is met.

1   100.   The apparatus of claim 80, wherein said calibration process comprises a routine

2   which determines if the user can hear the calibration sound, and if not, then executes an

3   alternative calibration process.

1   101.   The apparatus of claim 80, wherein said calibration process comprises a routine

2   which determines if the user can hear the calibration sound, and if not, then executes an

3   alternative calibration process, the alternative calibration process determining a setting at which

4   the user cannot hear a set of test sounds.

1   102.   The apparatus of claim 80, wherein said calibration process includes at least one

2   flow which is executed if an error condition occurs, that prompts the user to perform an act to

3   correct a possible source of the error.

1   103.   The apparatus of claim 80, wherein said calibration process includes using the

2   audio resources to produce the masking sound, and determines a setting for the audio resources

3   at which the masking sound masks the calibration sound.

1   104.   The apparatus of claim 80, wherein said calibration process includes providing

2   input to the audio resources to produce the masking sound, the input including substantially

3   randomly generated signals, and determines a setting for the audio resources at which the

4   masking sound masks the calibration sound.

1   105.   The apparatus of claim 80, wherein said calibration process includes providing

2   input to the audio resources to produce the masking sound, the input including signals to produce

3   a masking sound having an audio spectrum matching a spectrum expected for the calibration

4   sound, and determines a setting for the audio resources at which the masking sound masks the

5   calibration sound.